

PROCEEDINGS
OF THE
ROYAL SOCIETY OF EDINBURGH.

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No. 63.

Monday, 4th January 1864.

PROFESSOR KELLAND, Vice-President, in the Chair.

The following Communications were read:—

1. On the great Drift-Beds with Shells in the South-west of Arran. By the Rev. Robert Boog Watson, B.A., F.R.S.E., Hon. Mem. Naturw. Ver. Lüneburg.

These beds, as examined by the author, lie in the Torlin or Kil-morie Burn basin, in the Scoradale or Slidry Water basin (more strictly in the first north or north-west tributary of each, reckoning upwards from the sea), and in the Clachan Glen,—all in the south-west of Arran. They are of great extent and depth; at certain points they contain boreal shells in considerable numbers. They are divisible into two classes, (1.) underlying fine dark sands and clays; and, (2.) overlying coarse red clay with striated stones, probably boulder clay.

They are interesting, because,

1. They present, in a striking form, proof of the immense destruction of the surface of the land.
2. They afford unusually good sections, from the rock on which they rest, upwards.
3. They throw some light on the formation of the boulder clay.
4. They present sea shells, at one point land plants, and also at one point a later lake basin.

The special information they give is,—

1. That *all* the latest geological changes have not materially affected the relations of hill and valley.
2. That the valleys were largely excavated by ice.
3. That the ice covered the land till it was submerged.
4. That the depression of the land below the sea was continuous, and ultimately attained 1000 feet at least.
5. That the depression was, at one point at least, sudden.
6. That this sudden fall did not begin later, at least, than the time at which the present 90 feet line above the sea-level reached the level of the sea.
7. That this sudden subsidence could not have amounted to less than 200 feet.
8. That it could not have much exceeded 300 feet.
9. That under obvious limitations, the beds which lie *nearest the sea-level and deepest below the surface*, are the *oldest*, and that those are *contemporary* which occupy the *same relative position to the sea-level and the underlying rock*.

2. On the Agrarian Law of Lycurgus, and one of Mr Grote's Canons of Historical Criticism. By Professor Blackie.
3. On the Occurrence of Amœbiform Protoplasm and the Emission of Pseudopodia in the Hydroida. By Professor Allman.

The author described the contents of the small tubular appendages, named Nematophores by Busk, which are developed upon certain definite points of the hydrosome in the *Plumularidæ*. These contents were shown to consist of a granular protoplasm, with occasionally a cluster of large thread-cells embedded in it.

The protoplasm has the property of emitting pseudopodia, which are very extensile and mutable in shape, and exactly resemble the pseudopodial prolongations, whose occurrence among the *Rhizopoda* is so eminently characteristic of this group of *Protozoa*. The contents of the nematophores, indeed, except alone in the presence of thread-cells, are indistinguishable in structure, and in the phe-

nomena presented by them from the sarcode or protoplasm, which forms the substance of an amoeba, a diffugia, or an arcella.

The following Gentleman was elected a Fellow of the Society:—

JAMES DAVID MARWICK, Esq.

The following Donations to the Library were announced:—

Journal of the Statistical Society of London. December 1863 (with General Index). 8vo.—*From the Society.*

Monthly Notices of the Astronomical Society. Vol. XXIV., No. 1. 8vo.—*From the Society.*

Monthly Return of Births, Deaths, and Marriages Registered in the Four Principal Counties of Scotland. November 1863. 8vo.—*From the Registrar-General.*

Abhandlungen herausgegeben von der senckenbergischen naturforschenden Gesellschaft. Vierten Bandes, dritte u. vierte Lieferung. 4to.—*From the Society.*

Historia e Memorias da Academia real das Sciencias de Lisboa. Classe de Sciencias Moraes, Politicas e Bellas Lettras. Nova Serie. Tomo II., Parte II. 4to.—*From the Academy.*

Sitzungsberichte der königl. bayer. Akademie der Wissenschaften zu München. Jahrgang 1863, I. (Doppel) Heft IV. 8vo.—*From the Academy.*

Kongliga Svenska Vetenskaps-Akademiens Handlingar. Ny Följd, Fjerde Bandet, Första Häftet. 1861. 4to.—*From the Academy.*

Ofversigt af Kongl. Vetenskaps-Akademiens Förhandlingar. Nittonde Årgången. 1862. Meteorologiska Jakttågelsor i Sverige utgifna af kongl. Svenska Vetenskaps-Akademierna, bearbetade af Er. Edlund. Fjerde Bandet. 1861. Oblong 8vo.—*From the same.*

The Canadian Journal of Industry, Science, and Art. No. 48.—*From the Editors.*

Transactions of the Royal Scottish Society of Arts. Vol. VI. Part III. 8vo.—*From the Society.*

The Journal of Agriculture. January 1864. 8vo.—*From the Highland and Agricultural Society.*

The Journal of the Royal Geographical Society. Vol. XXXII.
8vo.—*From the Society.*

Jahrbuch der kaiserlich-königlichen geologischen Reichs-Anstalt.
1863. XIII. Band. 8vo.—*From the Austrian Government.*

Mémoires de l'Académie Impériale des Sciences de St. Petersburg.
VII^e Série. Tome IV., Nos. 10 et 11. 4to.—*From the Academy.*

Bulletin de l'Académie Impériale des Sciences de St. Petersburg.
Tome IV., Nos. 7-9. Tome V., Nos. 1 et 2. 4to.—*From the Academy.*

Tables of Heights in Sind, the Punjab, North-western Provinces,
and Central India, determined by the great Trigonometrical
Survey of India, Trigonometrically and by Spirit-Levelling
operations. 8vo.—*From the Director of the Survey.*

Monday, 18th January 1864.

His Grace the DUKE of ARGYLL, President, in the Chair.

The following Communications were read :—

1. Description of the Lithoscope, an instrument for distinguishing Precious Stones and other bodies. By Sir David Brewster, K.H.

The Instrument was exhibited.

2. On the Temperature of certain Hot Springs in the Pyrenees. By R. E. SCORESBY-JACKSON, M.D., F.R.C.P.

In the year 1835, Principal Forbes very carefully observed the temperatures of certain springs in the Pyrenees, with the view of ascertaining to what extent changes of temperature occur in them. Observations previously made were, for several reasons, of uncertain worth, and Principal Forbes was desirous of then fixing "data for future observers with a degree of accuracy hitherto unattempted."

The author having determined to spend his autumn holidays in the Pyrenees, believed that a careful repetition of such observations, after the lapse of twenty-eight years, would afford results of

some interest. He furnished himself with accurate thermometers made for the purpose, and, during the month of August, carefully observed the temperatures of several of the springs visited by Principal Forbes in 1835. In the tables which are distributed through the paper, the temperatures of the springs are given as recorded by different observers at various periods between the years 1835 and 1863. From these records it would appear that whilst there is perhaps in no instance a general or permanent change of temperature, neither is there in any an undeviating temperature. It is probable that the temperatures of the springs in the interior of the globe have undergone no change, and that the changes observable upon the surface of the earth are due to superficial causes, such as external temperature, the infiltration of cold surface water, &c. To a certain extent, an allowance must be made for inaccuracies; for it is scarcely to be supposed that all the observers dipped their thermometers exactly at the same points, nor does the author know that in all cases the instruments employed were without errors.

3. On Human Crania allied in Anatomical Characters to the Engis and Neanderthal Skulls. By Wm. Turner, M.B., Senior Demonstrator of Anatomy in the University.

The Author compared the above crania with various human skulls which had come under his observation. He exhibited a skull brought by Mr Henry Duckworth, F.G.S., from St Acheul near Amiens, which in its general contour presented a striking resemblance to the Engis skull. The St Acheul skull was somewhat smaller, being probably that of a female. It might almost have been regarded as a reduced copy of the Engis skull. There was no evidence that the skull from St Acheul was of an earlier date than the Gallo-Roman period of French history. The Neanderthal skull was compared with several modern crania, mostly British, especially with reference to the projection of the supra-orbital ridges, the retreating forehead, and the slight convexity of the occipital region. He exhibited several skulls which were closely allied to it in one or other of these features. It was shown also that

the Neanderthal skull, although below the European mean in its internal capacity, yet exceeded the dimensions of some normal modern European crania which had been carefully measured—its large transverse parietal diameter compensating for the brain space lost by the retreating forehead and flattened occiput.

As the history and geological age of the Neanderthal skull were both unknown, and as many of its most striking anatomical characters were closely paralleled in some modern European crania, the Author considered that great caution ought to be exercised in coming to any conclusion, either as to the pithecoïd affinities or psychical endowments of the man to whom it originally appertained.

4. Notice of a Simple Method of Approximating to the Roots of any Algebraic Equation. By Edward Sang, Esq.

M. Lagrange, on applying the method of continued fractions to the resolution of numerical equations, discovered that, for those of the second degree, the quotients recur periodically. From this, combined with the previously well known fact that all periodic chain fractions belong to quadratics, he inferred that periodicity is exclusively confined to equations of this order.

In January 1858, I showed to the Royal Society that the series of approximating fractions obtained by M. Lagrange can be continued in the opposite direction, and that the convergence then is to the other root; and enunciated the general theorem, that if any two fractions be assumed, and if a progression be formed from them by combining fixed multiples of their members, this progression, which I called *duerr* or two-headed, may be continued in either way, and gives on the one hand the one, on the other hand the other root of a quadratic.

This would seem to confirm Lagrange's view of the limited application of periodicity.

However, we may observe that our attention has been restricted to one kind of periodicity; there may be recurrences of higher orders which may belong to equations of higher degrees. Thus if, instead of beginning with two fractions, we had assumed three, and formed the progression by combining specified multiples of the last,

the penult and the antepenult, the terms of the progression would approach to some limit which, not being the root of a quadratic, may be the root of a cubic or of some higher equation; such a progression may be extended backwards, giving an approximation to another root; and we may still farther complicate the recurrence by using four, five, or any number of fractions.

While engaged in examining the nature of such progressions, and seeking for a demonstration of some general properties which they seemed to possess, I came upon a very simple theorem, which gives great facility in the search for the roots of equations.

If we put an algebraic equation in the usual form—

$$ax^n + bx^{n-1} + \dots + px + q = 0,$$

multiply each term by its exponent; thus,

$$nax^n + \overline{n-1} bx^{n-1} + \dots + p + 0,$$

and divide the expression so obtained by the original polynome, developing the quotient according to the descending powers of x , the resulting series takes the form

$$n + Ax^{-1} + Bx^{-2} + Cx^{-3} + Dx^{-4} + \&c.;$$

or if we develop the quotient according to the ascending powers of x , and change the signs, we have, writing from right to left,

$$+ \&c. + \delta x^4 + \gamma x^3 + \beta x^2 + \alpha x,$$

and these two series conjoined make a duser progression; thus,

$$+ \&c. + \delta x^4 + \gamma x^3 + \beta x^2 + \alpha x + n + Ax^{-1} + Bx^{-2} + Cx^{-3} + Dx^{-4} + \&c.,$$

approaching on either side to a geometrical progression, the common ratio of which is a root of the equation; that is to say, if we divide the coefficient of any term by that of the term to its left, we shall have an approximation to a root more and more close the farther we proceed along the series. The approximation on the right hand is to the root farthest from zero, that on the left hand to the root nearest to zero.

If the equation $2x^3 - 11x^2 + 13x - 3 = 0$ were proposed, we should form from it the expression $6x^3 - 22x^2 + 13x - 0$, and, by division, thence form the progression

$$3 + \frac{11}{2.x} + \frac{69}{2^2.x^2} + \frac{509}{2^3.x^3} + \frac{3937}{2^4.x^4} + \frac{30901}{2^5.x^5} + \frac{243657}{2^6.x^6} + \&c.,$$

which shows that the fractions

$$\frac{11}{2 \cdot 3}, \frac{69}{2 \cdot 11}, \frac{509}{2 \cdot 69}, \frac{3937}{2 \cdot 509}, \frac{30901}{2 \cdot 3937}, \frac{243657}{2 \cdot 30901}, \&c.$$

converge to the greatest root of the equation. Or, performing the division from the right hand, observing to change the signs, we have

$$+\&c. + \frac{898034}{3^6} x^6 + \frac{91913}{3^5} x^5 + \frac{9367}{3^4} x^4 + \frac{964}{3^3} x^3 + \frac{103}{3^2} x^2 + \frac{13}{3} x,$$

showing that the fractions

$$\&c., \frac{3 \cdot 91913}{898034}, \frac{3 \cdot 9367}{91913}, \frac{3 \cdot 964}{9367}, \frac{3 \cdot 103}{964}, \frac{3 \cdot 13}{103},$$

converge to the least root of the equation.

In this case we have the duserr progression,

$$\&c., \frac{9367}{3^4}, \frac{964}{3^3}, \frac{103}{3^2}, \frac{13}{3}, 3, \frac{11}{2}, \frac{69}{2^2}, \frac{509}{2^3}, \frac{3937}{2^4}, \&c.,$$

of which the centre term 3 is the index of the order of the equation, and of which if we take any four consecutive terms, which we may denote by P, Q, R, S, we have the equation

$$2S - 11R + 13Q - 3P = 0,$$

by help of which we can readily continue the progression either way; thus,

$$S = \frac{3P - 13Q + 11R}{2}, \quad T = \frac{3Q - 13R + 11S}{2}, \quad \&c.$$

for the progress to the right hand; or,

$$\&c., \quad O = \frac{13P - 11Q + 2R}{3}, \quad P = \frac{13Q - 11R + 2S}{3},$$

without the necessity of going through the details of the division.

If we denote by $r_1, r_2, r_3, \&c.$, the roots of the equation, the coefficients of the powers of x in the duserr progression are the sums of the powers of $r_1, r_2, \&c.$ inverse of the power of x ; that is to say,

$$A = \Sigma (r^1); \quad B = \Sigma (r^2); \quad C = \Sigma (r^3), \&c.; \quad \text{while}$$

$$\alpha = \Sigma (r^{-1}); \quad \beta = \Sigma (r^{-2}); \quad \gamma = \Sigma (r^{-3}), \&c.$$

Now if we have a number of unequal quantities, r_1, r_2, r_3 , and take their successive powers, the power of the largest of them may be made to exceed the sum of the corresponding powers of all the

others in any required proportion, so that if R denote the greatest of all the roots, the ratio $R^m : \Sigma (r^m)$ may be brought, by taking m sufficiently great, as nearly to a ratio of equality as we desire ; of necessity, the ratio $R^{m+1} : \Sigma (r^{m+1})$ will be still more nearly that of equality ; wherefore the quotient

$$\frac{\Sigma (r^{m+1})}{\Sigma (r^m)}$$

may be made to approximate to the value of R within any prescribed degree of nearness.

Similarly, on taking the successive inverse powers, those of the greater diminish much more rapidly than those of the smaller quantities ; wherefore we may continue the progression towards the left hand until the sum $\Sigma (r^{-m})$ may have to the $-m^{\text{th}}$ power of the least root, ρ , a ratio differing from that of equality as little as may be desired, in which case the two ratios

$$\Sigma (r^{-m-1}) : \Sigma (r^{-m}), \text{ and } \rho^{-m-1} : \rho^{-m}$$

will be nearly alike ; that is to say, the quotient $\frac{\Sigma (r^{-m})}{\Sigma (r^{-m-1})}$ will

differ from the smallest root, ρ , by an imperceptible quantity.

The chief use of this approximation will probably be found in practice to be to give a starting point for the more rapid methods already known, which methods are only rapid when the root has to be approached from a small distance. Yet, having obtained a pretty close approximation, s , to some root, we have only to make the substitution $x - s = y$, to obtain a new equation, having one root very small in comparison with the others, and to which, therefore, the approximation by this method will be very rapid.

When the root R is positive, the signs of the quantities A , B , C , &c. become continuous and $+$; if R be negative, they must be alternate ; and it is to be observed that if the coefficients of the even powers of x become negative, the root must be imaginary. Also, if there should be two roots, R and $-R$, nearly equal to each other, the coefficients of the odd powers will become small in comparison with those of the even powers, in which case it may be convenient to take

$$\sqrt{\left\{ \frac{\Sigma (r^{m+2})}{\Sigma (r^m)} \right\}}$$

as the formula for approximation.

5. Notice of the State of the Open-Air Vegetation in the Edinburgh Botanic Garden, during December 1863.
By J. H. Balfour, A.M., M.D., F.R.S., F.L.S.

The state of the vegetation in the open ground of the Botanic Garden during the month of December 1863 was so very remarkable that I have been induced to submit a notice of it to the Royal Society. The number of phanerogamous species and varieties in flower during the month amounted to 245; of these 35 were spring-flowering plants which had anticipated their period of florescence, while the rest were summer and autumn flowers which had protracted their flowering beyond their usual limits.

The following are the details as given by Mr M'Nab:—

Plants in flower in the Royal Botanic Garden, Edinburgh, from
1st to 31st December 1863.

Annual plants, chiefly summer and autumn flowering species and varieties, ...	36
Perennial plants, chiefly summer and autumn flowering species and varieties, ...	133
Trees and shrubs, chiefly autumn flowering, ...	41
Spring-flowering trees, shrubs, and perennial herbaceous plants, ...	35
Total flowering plants, ...	245

I have drawn up a list of all the plants in flower during December, arranged according to their natural orders; and I have also requested Mr James Tod, one of my assistants, to dry a complete series of the plants, and to exhibit them in one view on pasteboard.

In looking at the list we shall find that the following spring-flowering plants developed flower-buds and blossoms:—

List of Spring-Flowering Plants picked in flower in Dec. 1863.

<i>Eranthis hyemalis</i>	<i>Hepatica triloba</i>
<i>Helleborus abschasicus</i>	<i>Aubrietia grandiflora</i>
<i>olympicus</i>	<i>Draba verna</i>
<i>purpurascens</i>	<i>Iberis sempervirens</i>

Viola odorata
 Orobus cyaneus
 vernus
 Cydonia japonica
 Potentilla Fragariastrum
 Dondia Epipactis
 Doronicum caucasicum
 Petasites fragrans
 nivea
 Erica herbacea
 Rhododendron atrovirens
 Nobleanum
 Gentiana acaulis
 Phlox verna

Anchusa sempervirens
 Omphalodes verna
 Symphytum caucasicum
 tauricum
 Primula denticulata
 elatior and vars. (Poly-
 anthus)
 veris
 vulgaris
 Corylus Avellana
 Sisyrinchium grandiflorum
 Galanthus nivalis
 Muscari racemosum
 Knappia agrostidea

The following is a complete list of the Plants in flower during
 December 1863 :—

RANUNCULACEÆ :

Eranthis hyemalis
 Helleborus abschasicus
 foetidus
 niger
 odorus
 olympicus
 purpurascens
 Hepatica triloba
 Ranunculus auricomus
 repens
 Trollius asiaticus

BERBERIDACEÆ :

Berberis Darwinii
 Epimedium violaceum
 Mahonia Aquifolium

FUMARIACEÆ :

Fumaria officinalis

CRUCIFERÆ :

Alyssum saxatile
 Arabis albida
 procurrens
 Aubrietia deltoidea
 grandiflora
 Capsella Bursa-pastoris
 Cheiranthus Cheiri
 ochroleucus
 Coronopus didyma
 Koniga maritima
 Draba verna
 Erysimum bipinnatifidum

CRUCIFERÆ :

Erysimum strictum
 Iberis gibraltarica
 sempervirens
 Lepidium procumbens
 Lunaria biennis
 Matthiola incana

POLYGALACEÆ :

Polygala Chamæbuxus

RESEDACEÆ :

Reseda Luteola
 odorata

VIOLACEÆ :

Viola odorata
 palmensis
 tricolor
 b. arvensis

CARYOPHYLLACEÆ :

Cerastium tomentosum
 viscosum
 Dianthus Caryophyllus
 chinensis
 Lychnis diurna
 Flos-cuculi
 vespertina
 Silene italica
 muscipula
 Spargula arvensis
 Stellaria media

HYPERICACEÆ :

Hypericum Androsæmum

GERANIACEÆ :

- Erodium tataricum
- Geranium dissectum
phæum
- Pelargonium zonale

OXALIDACEÆ :

- Oxalis corniculata

RUTACEÆ :

- Ruta graveolens

RHAMNACEÆ :

- Ceanothus africanus

LEGUMINOSÆ :

- Coronilla Emerus
- Indigofera australis
- Lathyrus odoratus
- Lupinus Murrayanus
nootkatensis
- Medicago arborea
- Orobus cyaneus
vernus

ROSACEÆ :

- Acæna adscendens
novæ-zealandiæ
pubescens
- Alchemilla alpina
arvensis
vulgaris
- Aremonia agrimonioides
- Cydonia japonica
- Geum coccineum
montanum
pyrenaicum
- Potentilla alba
alpestris
Fragariastrum
nepalensis
splendens
stricta
- Rosa gallica
indica
- Sibbaldia maxima
- Spiræa Filipendula

MYRTACEÆ :

- Leptospermum salicifolium
- Myrtus communis

ONAGRACEÆ :

- Fuchsia gracilis

PORTULACACEÆ :

- Claytonia perfoliata

HAMAMELIDACEÆ :

- Hamamelis virginica

UMBELLIFERÆ :

- Apium graveolens
- Astrantia major
- Dondia Epipactis
- Myrrhis odorata
- Petroselinum vulgare
- Torilis nodosa

ARALIACEÆ :

- Hedera Helix

CAPRIFOLIACEÆ :

- Viburnum Lantana
Tinus

LORANTHACEÆ :

- Viscum album

VALERIANACEÆ :

- Centranthus macrosiphon

DIPSACACEÆ :

- Scabiosa atropurpurea
caucasica
ciliata
sylvatica

COMPOSITEÆ :

- Achillea Millefolium
- Anthemis Cotula
nobilis
- Aster foliosus
novæ-angliæ
novi-belgii
rigidulus
- Bellis perennis
- Calendula officinalis
- Calimeris hispida
- Centaurea montana
- Cnicus atropurpureus
- Doronicum caucasicum
- Eurybia Gunniana
- Gazania rigens
uniflora
- Helichrysum arenarium
- Lapsana communis
- Leontodon Taraxacum
- Matricaria inodora
Parthenium
- Petasites fragrans
niveus
- Pyrethrum carneum
sinense
- Scorzonera hispanica
- Senecio sylvaticus
viscosus
vulgaris

COMPOSITÆ :

Solidago sempervirens
Sonchus oleraceus
Tanacetum multiflorum

CAMPANULACEÆ :

Campanula grandis
suaveolens

ERICACEÆ :

Andromeda floribunda
polifolia
Calluna vulgaris (*rubra* et
alba)
Daboecia polifolia
Erica ciliaris
cinerea
herbacea
mediterranea hibernica
Mackaiana
stricta
Tetralix
vagans
Phyllodoce cœrulea
empetriformis
Rhododendron atrovirens
Nobleanum

AQUIFOLIACEÆ :

Ilex Aquifolium

JASMINACEÆ :

Jasminum nudiflorum

APOCYNACEÆ :

Vinca major
minor *single* and *double*

GENTIANACEÆ :

Gentiana acaulis

POLEMONIACEÆ :

Leptosiphon androsaceus
Phlox Drummondii
verna

Polemonium pulchellum

BORAGINACEÆ :

Anchusa sempervirens
Omphalodes verna
Symphytum caucasicum
tauricum

SCROPHULARIACEÆ :

Antirrhinum majus
Calceolaria perfoliata
Linaria Cymbalaria

LINARIÆ :

Linaria tristis
versicolor

LINARIÆ :

Pentstemon gentianoides
Scrophularia annua
nodosa
vernalis
Verbascum cashmeriense
Veronica agrestis
aggregata
Andersonii
Buxbaumii
decussata
montana
salicifolia

LABIATÆ :

Lamium album
lævigatum
maculatum
purpureum
Marrubium vulgare
Nepeta Cataria
incana
Micromeria græca
Prunella origanifolia
Salvia obovata
Sideritis syriaca
Teucrium Arduini
Scorodonia

PRIMULACEÆ :

Primula Auricula
denticulata
elatior and vars. (*Poly-*
anthus)
veris
vulgaris

VERBENACEÆ :

Verbena Tweediana

PLUMBAGINACEÆ :

Armeria pseudo-armeria
pubescens
Statice latifolia

POLYGONACEÆ :

Rumex Acetosella
acutus

THYMELEACEÆ :

Daphne pontica

EUPHORBIACEÆ :

Buxus sempervirens
Euphorbia Peplis

URTICACEÆ :

Parietaria officinalis
Urtica urens

CORYLACEÆ :

Alnus cordifolia
Corylus Avellana

GARRYACEÆ :

Garra elliptica

CONIFERÆ :

Cryptomeria japonica
Cupressus Lawsoniana
Thuja plicata

TAXACEÆ :

Cephalotaxus Fortuni
Taxus baccata

IRIDACEÆ :

Iris tenax
Sisyrinchium anceps
grandiflorum

AMARYLLIDACEÆ :

Galanthus nivalis
Alstroemeria aurantiaca

LILIACEÆ :

Muscari racemosum
Tritoma media

NAIADACEÆ :

Aponogeton distachyum

CYPERACEÆ :

Carex muricata
paniculata
Scirpus Holoschoenus

GRAMINEÆ :

Arrhenatherum avenaceum
Gynierium argenteum
Holcus lanatus
Knappia agrostidea
Lagurus ovatus
Lolium perenne
Panicum capillare
Poa annua
nemoralis = 245

The following Ferns were also in fructification :—

Asplenium Ruta-muraria
Blechnum boreale
Lastrea dilatata
Filix-mas cristata
rigida

Polypodium vulgare
Polystichum acrostichoides
Lonchitis
Scolopendrium vulgare = 9

NOTE.—Up to 4th February the only other plants in flower have been the following :—24th January—*Nordmannia cordifolia*. 2d February—*Galanthus plicatus*. 11th February—*Leucojum vernum*.

The state of vegetation in December was much influenced by the nature of the weather during the preceding months of October and November. No marked check was given to it during these months, and the temperature was such as to stimulate the action of the cells and vessels of the plants. In December the comparatively high temperature continued. I have asked my friend, Mr Alexander Buchan, Secretary of the Scottish Meteorological Society, to draw up for me a tabular view of the temperature of the three months during the last seven years. I have supplied the lowest daily temperatures, as observed in the Botanic Garden; and for want of sufficient data in the garden, he has selected for the other data a station in Fife (Balfour) where the temperatures in general resemble much those noticed at the Botanic Garden. (I hope to be able to make arrangements in future for a full series of thermometrical, barometrical, and hygrometrical observations being made at the Botanic Garden.)

1. *Mean Temperatures at Balfour, in Fife, in the months of October, November, and December, during seven years ending with 1863. A comparison of 1863 with the Means of the previous six years is also given.*

YEAR.	OCTOBER.			NOVEMBER.			DECEMBER.		
	Mean of Day.	Mean of Night.	Mean Temp.	Mean of Day.	Mean of Night.	Mean Temp.	Mean of Day.	Mean of Night.	Mean Temp.
1857	54.0	41.8	47.9	48.1	36.0	42.0	48.7	39.0	43.8
1858	50.8	38.3	44.5	45.0	33.8	39.4	43.3	33.9	38.6
1859	51.7	39.9	45.8	42.8	32.7	37.8	38.1	30.8	34.4
1860	52.7	42.1	47.4	42.5	37.6	40.0	36.3	29.0	32.6
1861	55.4	43.7	49.6	43.7	34.0	38.8	41.2	32.8	37.0
1862	54.3	41.1	47.7	42.9	30.6	36.8	46.2	38.6	42.4
Mean of 1857-62	53.2	41.1	47.2	44.2	34.1	39.1	42.3	34.0	38.1
1863	53.6	42.5	48.0	49.4	37.3	43.4	46.6	36.5	41.6
Excess of 1863 over the Mean of the previous 6 years	0.4	1.4	0.8	5.2	3.2	4.2	4.3	2.5	3.5

- II. *The Highest Temperature of the Day observed at Balfour, in Fife, in each week of the three months October, November, and December, during seven years ending with 1863.*

YEAR.	OCTOBER.					NOVEMBER.					DECEMBER.					Oct.	Nov.	Dec.
	1	8	15	22	29	5	12	19	26	3	10	17	24	Oct.	Nov.			
1857	63.0	56.0	59.5	56.0	57.0	51.0	51.5	52.5	54.0	56.0	50.5	53.5	51.5	63.0	57.0	56.0		
1858	61.0	59.0	51.5	54.0	52.0	47.0	46.0	46.0	56.0	52.0	45.0	50.5	46.5	61.0	56.0	54.0		
1859	65.6	61.1	57.6	39.6	45.9	51.6	47.9	46.4	45.6	46.5	45.4	40.1	43.6	65.6	51.6	46.6		
1860	60.1	56.6	55.6	59.1	48.6	47.6	46.6	45.1	45.6	45.1	44.6	37.6	36.1	60.1	48.1	45.6		
1861	59.6	63.6	56.1	59.6	50.6	49.6	44.6	51.6	54.6	44.6	54.1	47.6	41.6	63.6	54.6	54.6		
1862	65.6	65.1	59.6	55.6	54.6	47.6	46.1	43.1	44.1	52.6	49.6	51.6	49.6	65.6	54.6	52.6		
1863	61.0	57.0	58.0	58.0	55.0	47.5	56.0	57.0	58.0	52.0	53.0	55.0	50.5	61.0	58.0	55.0		

- III. *The Lowest Temperature of the Night observed at Balfour, in Fife, in each week of the three months October, November, and December, during seven years ending with 1863.*

YEAR.	OCTOBER.					NOVEMBER.					DECEMBER.					Oct.	Nov.	Dec.
	1	8	15	22	29	5	12	19	26	3	10	17	24	Oct.	Nov.			
1857	31.0	44.0	42.0	31.0	31.0	32.5	33.0	26.0	26.0	36.0	36.0	33.0	28.0	31.0	26.0	28.0		
1858	35.0	34.5	33.0	30.0	30.0	31.5	28.0	22.0	36.0	26.5	25.0	31.5	31.0	30.0	22.0	25.0		
1859	41.3	38.5	29.5	24.5	24.3	24.5	27.5	29.5	28.5	26.5	23.5	15.0	26.5	24.3	24.5	15.0		
1860	41.5	30.5	40.0	39.0	37.5	38.5	27.5	26.5	30.0	39.5	30.5	18.0	1.5	30.5	26.5	1.5		
1861	36.0	37.5	34.0	35.5	31.5	26.5	23.5	22.5	25.5	29.0	31.5	26.5	22.5	32.5	22.5	22.5		
1862	34.5	37.0	36.5	35.0	29.0	27.0	20.5	20.5	22.0	35.5	33.0	34.5	31.5	29.0	20.5	31.5		
1863	29.5	45.5	40.0	34.0	28.5	26.5	32.5	35.0	30.0	31.0	38.5	30.0	23.5	29.5	26.5	23.5		

IV. *Number of Nights each Week on which the Thermometer, exposed in the Botanic Garden, four feet above the ground, fell to freezing (32°0). An asterisk (*) is put to indicate the nights on which it fell to at least 6°0 below freezing.*

YEAR.	OCTOBER.					NOVEMBER.				DECEMBER.			
	1	8	15	22	29	5	12	19	26	3	10	17	24
1857	1		1				1	*3	2				2
1858				*4		5	*5	*6		2	*5	1	
1859			*2	*5	*3	*2	4	*3	*5	3	*5	*6	6
1860		2			*3	4	*4	*2	*2		3	*7	*7
1861			2		3	*5	*3	*3	*2	1	1	*4	*7
1862					2	5	*6	*7	*5			1	
1863	1			2	*4	*4	1	1	*5	3		3	*5
Lowest each week in 1863, . . }	28·0	40·0	35·0	31·0	26·0	23·5	27·0	32·0	26·0	30·0	35·0	25·0	19·0

Report on the Weather of October, November, and December 1863, as compared with the previous Six Years. By MR ALEXANDER BUCHAN.

The first three tables present a detailed statement of the temperature in October, November, and December, during the seven years ending with 1863, as observed at Balfour, near Markinch, in Fife, one of the stations of the Scottish Meteorological Society. It is the nearest station to Edinburgh at which full and well-authenticated observations on temperature have been made for so long a period, and, besides, its position is such as to represent fairly both sides of the Forth.

Table I. gives the mean monthly temperature of the day and of the night, and the mean temperature of these months for the past seven years, and a comparison of 1863 with the means of the previous six years. From this Table, we learn that the peculiar features of the weather of October, November, and December last, as respects temperature, were as follow :—

In *October*, the mean temperature was nearly a degree (0°·8) above the average of the month ; but whilst the mean temperature of the day was less than half a degree (0°·4), that of the night was about a

degree and a-half ($1^{\circ}4$) above the average, thus indicating a cloudy sky and comparative absence of frost. At the Botanic Garden, the thermometer fell only three times to freezing, the lowest being $28^{\circ}0$ on the night of the 6th. This frost continued but for a short time, and very little damage was done except to Heliotropes; dahlias were only slightly affected.

In *November*, the mean temperature was $4^{\circ}2$ above the average, which increase was very unequally distributed between day and night,—the mean temperature of the day being $5^{\circ}2$, and of the night only $3^{\circ}2$ above the mean of the month. This temperature is not only greatly above the average, but it is also about a degree and a-half higher than any previously recorded November, and $6^{\circ}6$ higher than the November of 1862.

In *December*, the mean temperature was $3^{\circ}5$ above the average, and the manner of its distribution between day and night similar to November,—the mean of the day being $4^{\circ}2$, and of the night $2^{\circ}5$ above the average.

Hence the characteristic feature of the weather of this period is the unprecedentedly high temperature during the day in November and December,—a point to which special attention is directed.

Table II. gives the highest temperature of the day, and Table III. the lowest temperature of the night, in each week of the period under consideration.

Table IV. gives the number of nights each week on which the temperature at the Botanic Garden fell to freezing or lower, and an asterisk is put to mark those cases when it fell to at least $6^{\circ}0$ below freezing.

These tables furnish the data from which an explanation may be had of the remarkable vegetation of December last, in so far as that depended on the character of the then current weather. The explanation is twofold—*first*, the high temperature during the day in November and December; and, *secondly*, the comparative absence of frost during the night.

This remarkably high temperature was preceded by a period of cold weather, extending from the 29th of October to the 12th of November, during which frosts were of frequent occurrence. At Balfour the thermometer, four feet above the ground, and protected, fell to $26^{\circ}5$; and at the Botanic Garden, four feet above

the ground, but exposed, it fell to $23^{\circ}5$, and indicated freezing on ten nights. Though dahlias and other plants were destroyed, yet many survived, owing, it is supposed, to the remarkably dry state of the weather, and to the very brief periods during which the severity of the cold in each instance lasted. This cold period also contributed to the remarkable growth which followed, since by playing the part of winter, though in a modified degree, it arrested the vital functions, and gave plants the benefit of a fresh start with the warmth which succeeded.

The unprecedentedly high temperature began on the 13th of November, and continued with scarcely any interruption till Christmas: see Table II. Of this period the warmest part extended from the 13th of November to the end of the month, during which the mean temperature of the day was $52^{\circ}5$, or $9^{\circ}0$ above the average. This day temperature usually prevails about the end of April or beginning of May, when the temperature of the night is much lower than obtained in November last.

In the end of November and beginning of December (see Tables III. and IV.), the temperature of the night declined occasionally to freezing. At Balfour it fell to $30^{\circ}0$, and at the Botanic Garden (exposed) to $26^{\circ}0$,—a degree of frost insufficient to damage those autumn flowers which had stood the more severe frost in the beginning of November, or check the growth of the spring flowers rapidly coming into bloom.

This anomalous weather sufficiently accounts for the strange spectacle of *sweet peas* and *Hepaticas* blooming together.

The following Candidates were then balloted for, and elected Fellows of the Society:—

REV. DANIEL F. SANDFORD.

ROBERT S. WYLD, Esq., W.S.

The following Donations to the Library were announced:—

A Brief Memoir of the late Mr Thackeray. By James Hannay, Esq., author of "Singleton Fontenoy, R.N.," "Essays from the Quarterly," &c. 8vo.—*From the Author.*

Conspectus criticus Diatomacearum Danicarum. Kritisk oversigt

- over de Danske Diatomeer af Dr Phil. P. A. C. Heiberg.
8vo.—*From the Author.*
- Monthly Notices of the Astronomical Society. Vol. XXIV. No. 2.
8vo.—*From the Society.*
- The Journal of the Chemical Society. December 1863, January 1864.—*From the Society.*
- Leeds Philosophical and Literary Society. Annual Report for 1862-3. 8vo.—*From the Society.*
- Monthly Return of the Births, Marriages, and Deaths registered in the Eight Principal Towns of Scotland. December 1863.
8vo.—*From the Registrar-General.*
- The Relations of Science to Modern Civilisation. By Professor H. Hennessy. 8vo.—*From the Author.*
- Jahresbericht über die Fortschritte der Chemie, etc. Von H. Kopp u. H. Will, für 1862. Erstes Heft. 8vo.—*From the Authors.*
- Proceedings of the Royal Horticultural Society. January 1864.
8vo.—*From the Society.*
- Essays on Digestion. By Dr J. Carson. 8vo.—*From the Author.*
- Memorie Botaniche. Presentate alla R. Accademia delle Scienze Fisico-Matematiche, anno 1862. 4to.—*From the Society.*
- Proceedings of the Royal Society. Vol. XIII. No. 59. 8vo.—*From the Society.*
- Edinburgh Astronomical Observations. Vol. XII. 4to.—*From the Royal Observatory ; forwarded by the Astronomer-Royal for Scotland.*

Monday, 15th February 1864.

DR CHRISTISON, Vice-President, in the Chair.

The following Communications were read :—

1. On the Influence of the Refracting Force of Calcareous Spar on the Polarization, the Intensity, and the Colour of the Light which it Reflects. By Sir David Brewster, K.H., F.R.S.

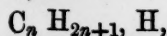
In the "Philosophical Transactions" for 1819, the author had shown that the doubly refracting force of calcareous spar extended beyond the sphere of the reflecting force, producing a change in

the polarising angle varying with the inclination of the incident ray to the axis of the crystal, and producing a deviation of the plane of polarisation from the plane of incidence and reflexion, when the reflecting force of the crystal was reduced by contact with oil of cassia and other oils. These experiments were made on the face of the primitive rhomb.

In the present paper, the author gives an account of the results which he obtained upon other natural and artificial faces of calcareous spar, inclined 0° , $5\frac{1}{2}^\circ$, 12° , $22\frac{1}{2}^\circ$, $67\frac{1}{2}^\circ$, and 90° , to the axis of the crystal. On all these surfaces, when the reflecting force is reduced by contact with oil of cassia or other oils and fluids, the intensity and colour of the reflected pencil, and the deviation of the plane of polarisation from the plane of reflection, experiences remarkable changes, depending on the inclination of the incident ray to the axis of double refraction.

2. On the Most Volatile Constituents of American Petroleum. By Edmund Ronalds, Ph.D.

It was shown by this paper that the gases dissolved in American petroleum, and which gave to it such a high degree of inflammability, were composed of the lower members of the marsh gas series, having the general formula,



and to which the liquid products have already been referred.

The gases evolved from the Pennsylvanian oil were collected at a temperature of -1° Cent., as they floated, mixed with air, over the surface of the liquid in the casks in which it is imported into this country and the hydrocarbons were shown by eudiometrical analysis to have the composition of a mixture in nearly equal proportions of the hydrides of ethyl and propyl.

The first portions of incondensable gas evolved on warming the most volatile product of the distillation of petroleum on a manufacturing scale were also found to contain a mixture of these hydrides, while portions of gas collected at a later period of the operation approached more closely to the composition of pure hydride of propyl, or were mixtures of the hydrides of propyl and butyl; the last gas collected being nearly pure hydride of butyl.

The liquid condensed by a mixture of ice and salt during the collection of these gases gave, upon redistillation, a considerable portion boiling between 0° and 4° Cent.; this, as well as that which passed over as high as 6° Cent., was shown by analysis to be nearly pure hydride of butyl having the composition C_4H_9 , H.

This liquid has a specific gravity of 0.600 at 0° Cent.; it is consequently the lightest liquid known. Its vapour density was by experiment found to be 2.11. It is colourless, possesses a sweet, agreeable smell, is soluble in alcohol and ether, but not in water. Alcohol of 98 per cent. dissolves between 11 and 12 times its volume of the gas at 21° Cent. The liquid and the gas are not preceptibly affected by sulphuric or nitric acid, nor by bromine; mixed with twice its volume of chlorine in diffuse daylight, the gas is converted into liquid chloride of butyl, while the original three volumes become condensed into two volumes of hydrochloric acid.

3.—On the Action of Terchloride of Phosphorus on Aniline. By Magnus M. Tait, F.C.S.

More than a year since my attention was directed to a statement of Hofmann's, that the action of terchloride of phosphorus on aniline yielded a white substance of crystalline character, as the investigation of this compound so produced seemed likely to be of interest, I began its examination, but circumstances prevented me from completing it at that time. The publication of Schiff's papers, however, on the metal-anilides again drew my notice to the subject, and I considered it a duty to myself to publish the results of my experiments, more especially as the reaction which forms the subject of this paper appears to have escaped the attention of that chemist.

Terchloride of phosphorus was added, drop by drop, to the aniline, which required to be kept cool by ice, as the reaction tends to be of a rather violent character, great heat being produced. In a short time the whole solidified into a soft granular mass, which dissolved readily in water, alcohol, and ether. The mass was dissolved in hot water, and, on cooling, the excess of aniline rose to the surface as an oily layer, and was separated by passing it through a moistened filter. The watery solution was evaporated at ordinary

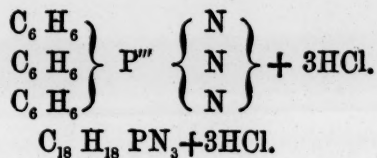
temperatures over sulphuric acid, and when it had reached a syrupy consistence it slowly solidified into a mass of fine needle-shaped crystals, which were the hydrochlorate of a new base, to which I give the name of Phosphaniline.

The crystals were well pressed between folds of filter paper, and then being placed on a filter, were washed with a very small quantity of alcohol and ether; again dissolved, and evaporated as before, the crystals were pure. The substance so obtained dissolves easily in water, alcohol and ether, and is neutral to test-papers. Gently heated, it sublimes, and gives fine prismatic crystals. Treated with solution of potash it is decomposed. Strong sulphuric acid expels hydrochloric acid, and gives a colourless solution. Nitric acid oxidises it, and gives a coloured solution.

On analysis, it yielded the following results:—

	I.	II.	Theory.
Carbon, . . .	45.12	...	44.63
Hydrogen, . . .	4.94	...	4.34
Phosphorus, . . .	...	...	
Nitrogen, . . .	...	...	
Chlorine, . . .	24.82	25.89	25.40

This analysis shows that the substance is produced by the direct union of the chloride of phosphorus and aniline. It is, however, a hydrochlorate, and is formed from three equivalents of aniline, in which three equivalents of hydrogen are replaced by phosphorus: thus—

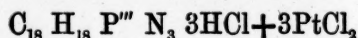


Platinochloride of Phosphaniline.—A portion of the original salt was dissolved in water, the solution acidified with hydrochloric acid, and bichloride of platinum added, in a short time crystals began to appear; these, after a sufficient quantity had formed, were placed on a filter and washed with a small quantity of alcohol and ether, and dried over strong sulphuric acid, until their weight was constant. They were in the shape of small granular crystals of a light yellow colour, soluble in alcohol and water, but not in ether. On analysis, the following numbers were obtained:—

	I.	II.	III.	Theory.
Carbon,	23.52	...	...	23.33
Hydrogen,	2.40	...	...	2.35
Phosphorus,	...	...	...	
Chlorine,	...	...	...	
Nitrogen,	...	...	...	
Platinum,	...	32.23	32.73	31.98

The platinum in the third column was estimated by direct ignition, the high result obtained was probably owing to the formation of a little phosphide of platinum.

The analysis corresponds with the following formula :—

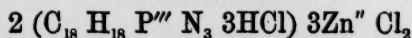


Zincochloride of Phosphaniline.—Hydrochloric acid was added to a portion of the solution of the hydrochlorate in water, and then some fragments of pure zinc were thrown in. After the zinc had dissolved the fluid was evaporated at a gentle heat (about 200° Fahr.), and filtered from a few greenish flakes which had formed, as even that low temperature appears to decompose the salt. The clear fluid was then put over sulphuric acid and left for some days, when crystals of a zinc salt were obtained, but under the same conditions as the hydrochlorate, as the solution was very concentrated before the salt appeared, and then it solidified completely. The crystals were pressed between folds of filter paper, and washed with a mixture of alcohol and ether, and dried in vacuo over strong sulphuric acid. They were white needles, slightly deliquescent, and soluble in alcohol. In ether it does not dissolve, but it becomes liquid, having the same appearance as a drop of oil in water.

The chlorine only was estimated, the analysis gave—

	I.	Theory.
Chlorine, ...	34.57	34.23

which agrees with the following formula :—



Bromine water immediately precipitates a brownish-coloured substance from an aqueous solution of the hydrochlorate. This precipitate was washed with water, and a portion of it boiled for some time, and found to be insoluble in water; but a substance appeared to have volatilized along with the vapour of the water, as

the neck of the flask and a glass rod which was held over the mouth of it were covered with white feathery crystals. The fluid was filtered, and, after drying the brown residue, it was put into a beaker covered with filter-paper, and left over a water-bath, when it nearly all sublimed in crystals corresponding to those obtained when attempting to dissolve it. A few of these crystals were dissolved in alcohol and bichloride of platinum added, but no precipitate was formed, and on evaporation the original substance crystallized out. These circumstances indicated the body to be Tribromaniline. The filtrate from the brown substance obtained originally was treated with bichloride of platinum also, but no precipitate forming, it was presumed no bromaniline or bibromaniline had been formed.

Cadmium Salt.—Chloride of cadmium gives, with strong solutions of the hydrochlorate, scaly crystals of a double salt, moderately soluble in water.

Copper Salt.—On adding chloride of copper to a solution of the hydrochlorate, and evaporating over sulphuric acid, small granular crystals of a beautiful green colour are obtained.

Mercury Salt.—If a strong solution of chloride of mercury is added to a concentrated solution of the hydrochlorate, beautiful white scaly crystals precipitate out immediately; but if the solutions are dilute no precipitation takes place, if the solution is now warmed, a crystalline substance is thrown down. This appears the more curious, when it is known that the other salts cannot be heated without decomposition.

When the hydrochlorate is heated with potash the phosphaniline, at the moment of separation, appears to undergo decomposition, for the smell of aniline is apparent even in the cold, but no precipitation takes place, so that phosphaniline must be itself soluble in water. An attempt was made to obtain it in the separate state by acting on the hydrochlorate with oxide of silver, a precipitate of chloride of silver was formed immediately. The filtered fluid was alkaline to test paper; it clearly contained phosphaniline, but on evaporating the fluid it became coloured, owing to the decomposition of the base, which is very changeable, and cannot be obtained in the pure state.

4. On Fermat's Theorem. By Professor Tait.

The author stated that in consequence of Legendre's work, the proof of Fermat's Theorem is reducible to showing the impossibility of

$$x^m = y^m + z^m,$$

when m is an *odd prime*, x, y, z being integers.

Talbot has shown that in this case x, y, z are necessarily *composite* numbers.

The author shows, among other results of very elementary processes, that if numbers *can* be found to satisfy the above equation, x and y leave the remainder 1 when divided by m ; and that z has m as a factor. Many farther limitations are given on possible values of x, y, z —the process being based on the consideration of their prime factors, and on Fermat's Elementary Theorem $N^m - N = Nm$.

5. Professor Archer called attention to a curious binocular telescope, bearing the following inscription :—

PETRVS PETRONVS
SAC : CÆS^{AR} ET CAT^{ULVS};
MAIES^{TRIS} OPTICVS
MEDLANI 1726

The eye-pieces and object-glasses, each in a separate tube, worked in a case $15\frac{1}{2}$ inches in length by 5 inches in breadth, and 2 in depth, forming, with the bevelled corners, a flat octagon, covered with a species of shagreen, and mounted in silver. An exceedingly simple and ingenious arrangement, consisting of a double screw working four small arms of brass, was placed at each end for the purpose of regulating the distances between each pair of glasses, and silver dial plates enabled the operator to set the instrument according to his ascertained requirements. The instrument belongs to the Royal Institution of Liverpool, and is supposed to have been part of a collection of rarities, made by Wm. Roscoe, in Italy. As a telescope, it is of great power; the focus is adjusted by one portion of the case acting as a draw-tube within the other part.

The following Gentleman was elected a Fellow of the Society :—

WILLIAM WALLACE, Ph.D., F.C.S.

The following Donations to the Library were announced:—

- Astronomical and Meteorological Observations made at the Radcliffe Observatory, Oxford, in the year 1861. Vol. XXI. 8vo.—*From the Radcliffe Trustees.*
- Proceedings of the Royal Society of London. Vol. XIII. No. 60. 8vo.—*From the Society.*
- The Classification of Animals based on the Principle of Cephalization.—On Fossil Insects from the Carboniferous Formation in Illinois. By James D. Dana. 8vo.—*From the Author.*
- Die Fortschritte der Physik in 1861 dargestellt von der physikal. Gesellsch. zu Berlin, XVII Jahrgang. 1te u. 2te Abtheil. 8vo.—*From the Society.*
- Sitzungsberichte der königl. bayer. Academie der Wissenschaften zu München. 1863. II. Heft I. and II. 8vo.—*From the Academy.*
- Journal of the Royal Dublin Society. No. XXX. 8vo.—*From the Society.*
- Journal of the Royal Asiatic Society. Vol. XX. Parts 3 and 4. 8vo.—*From the Society.*
- Journal of the Scottish Meteorological Society. Jan. 1864 (New Series). 8vo.—*From the Society.*
- Journal of the Chemical Society, February 1864. 8vo.—*From the Society.*
- Monthly Notices of the Royal Astronomical Society. Vol. XXIV. No. 3. 8vo.—*From the Society.*
- Proceedings of the Royal Horticultural Society. Feb. 1864. 8vo.—*From the Society.*
- Abstracts of Proceedings of the Geological Society of London. Nos. 105 and 106.—*From the Society.*
- Otago Provincial Government Gazette. Vol. VI. No. 274. Small folio. Containing Report by Dr James Hector, on the Geological Expedition to the West Coast of Otago, New Zealand.—*From the Provincial Government.*
- Nova Acta Regiæ Societatis Scientiarum Upsaliensis. Series Tertîæ. Vol. IV. Fasc. II. 1863. 4to.—*From the Society.*
- Abhandlungen der königl. Academie der Wissenschaften zu Berlin. Aus dem Jahre 1862. 4to.—*From the Academy.*